

## Course Competencies Template – Form 112

GENERAL INFORMATION	
Course Prefix/Number: <b>BSC-2427L</b>	Course Title: <b>Biotechnology Methods and Applications-L-II</b>
Number of Credits: 2	
Degree Type	<input type="checkbox"/> B.A. <input type="checkbox"/> B.S. <input type="checkbox"/> B.A.S <input checked="" type="checkbox"/> A.A. <input checked="" type="checkbox"/> A.S. <input type="checkbox"/> A.A.S. <input type="checkbox"/> C.C.C. <input type="checkbox"/> A.T.C. <input type="checkbox"/> V.C.C
Date Submitted:	Effective Year/Term:
<input checked="" type="checkbox"/> New Course Competency <input type="checkbox"/> Revised Course Competency	
Course Description (limit to 50 words or less):  This laboratory course is designed to complement BSC-2427 Biotechnology Methods and Applications II. This is a hands-on course that emphasizes advanced laboratory principles, techniques, and instrumentation necessary for effective work in a pharmaceutical-, biotechnology- and/or research-laboratory setting(s).	
Prerequisite(s): <b>BSC-2426 and BSC-2426L</b>	Corequisite(s): <b>BSC-2427 Biotechnology Methods and Applications-II</b>

**Course Competencies:** (for further instruction/guidelines go to: <http://www.mdc.edu/asa/curriculum.asp>)

**Competency 1:** Upon successful completion of this course, students will demonstrate knowledge, competency and application of *tissue culture techniques* by:

1. Describing procedures used in establishing mammalian and plant cell and tissue cultures.
2. Explaining the differences between primary cell cultures, cell lines, and cellular senescence.
3. Defining the function of plating, isolation, and transfection of cell lines.
4. Explaining contamination problems common to cell cultures and implementing the use of proper aseptic techniques during cell culture procedures.
5. Maintaining tissue cultures.
6. Identifying the biohazards related to tissue culture.

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**Competency 2:** Upon successful completion of this course, students will demonstrate knowledge of *recombinant DNA technology* by:

1. Explaining the principles of recombinant DNA technology.
2. Conducting Polymerase Chain Reaction (PCR) to amplify a DNA fragment.
3. Explaining the purpose of mutagenesis and its role in recombinant DNA technology.
4. Performing a DNA ligase reaction.
5. Explaining the preparation of bacterial competent cells.
6. Performing a bacterial transformation with recombinant DNA.
7. Plating transformed cells on selective medium.
8. Listing methods to identify transformants containing the recombinant DNA.
9. Selecting clones containing the recombinant DNA.
10. Extracting recombinant DNA from cells.
11. Estimating the quality and quantity of the recombinant DNA.

**Competency 3:** Upon successful completion of this course, students will demonstrate an understanding of *gene analysis* by:

1. Conducting restriction analysis of recombinant DNA.
2. Defining differences between genetic, cytological and physical maps.
3. Performing a non-radioisotopic DNA sequencing protocol to obtain the sequence of the recombinant DNA.
4. Conducting comparative computer analyses of the recombinant DNA with genomics and proteomics databases.

**Competency 4:** Upon successful completion of this course, students will demonstrate practical knowledge of *cellular transfection on plant and mammalian cells* by:

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1. Explaining the purpose of transfection.
2. Conducting transfection of plant tissue using bacterial cells containing recombinant DNA.
3. Performing mammalian cell transfection using recombinant DNA.
4. Listing methods of selection for plant and mammalian cell transfections.
5. Maintaining transiently-transfected plant tissues under green-house conditions.
6. Selecting and propagating positively-transfected mammalian cell lines.

**Competency 5:** Upon successful completion of this course, students will demonstrate knowledge of the *isolation and characterization of recombinant proteins* by:

1. Defining the techniques used for extraction and purification of recombinant proteins.
2. Implementing electrophoresis for qualitative protein analysis.
3. Explaining the chemical reaction responsible for the Bradford Assay and its use in determining protein concentration.
4. Performing Enzyme-Linked Immunosorbent Assay (ELISA).
5. Designing in vitro assays to test the activity of a protein.

**Competency 6:** Upon successful completion of this course, students will demonstrate knowledge of the *principles of bioremediation* technology by:

1. Explaining the bioremediation of hydrocarbons through the identification of oil-degrading bacteria in soil.
2. Illustrating the use of microorganisms in industrial mining for the extraction of mineral ores and metallic ions from waste water.
3. Demonstrating interdependence of bioremediation and biodegradation through the use of vermicomposting, small-scale composting units and/or can bioreactors.

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**Competency 7:** Upon successful completion of this course, students will demonstrate knowledge of the *lifecycle of a biotechnology product* by:

1. Comparing and contrasting the guidelines for development of a product for consumption or pharmaceutical applications.
2. Explaining procedures, rules and ethical issues concerning in vivo analysis of proteins designed for consumption or pharmaceutical applications.
3. Describing the federal regulations for the proper use of animals in research, testing and/or education.
4. Describing federal regulations for research dealing with human tissues and subjects.
5. Describing the role of the Institutional Review Board (IRB) in maintaining compliance.
6. Summarizing the goals and principles of clinical trials.
7. Designing a clinical trail for a new protein.
8. Discussing the ethical issues pertaining to animal research and clinical trials.

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